May 23, 2002

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ENVIRONMENTAL AFFAIRS

Ms. Rose Myers
Indiana Department of Environmental Management
Office of Land Quality
100 N. Senate Avenue
P. O. Box 6015
Indianapolis, IN 46206-6015

Subject:

Tier II Sampling and Analysis Report

Gary Sanitary Landfill

Gary, Indiana

Telephone

Dear Ms. Myers:

630.574.2006

On behalf of the City of Gary Department of Environmental Affairs, Earth Tech is submitting 3 copies of the report referenced above for your review and approval.

Facsimile

630.574.2007

As follow-up to our April 12, 2002 meeting and the subsequent May 2, 2002 letter from IDEM, Earth Tech conducted a Tier II Sampling and Analysis Test at the Gary Landfill in early May 2002. The work performed and results obtained are contained in the attached report.

On behalf of the City of Gary, we appreciate the opportunity to submit these results for consideration. If you have any questions or need additional information, please do not hesitate to call us at (616) 942-9600 or (630) 574-2006.

Very Truly Yours,

Earth Tech, Inc.

Mike Niemann

Senior Scientist

Andrew J. Querio, P.E.

Project Manager

attachment

cc: Tom Daugherty, P.E. (IDEM)

Dorreen Carey (City of Gary Department of Environmental Affairs) Bob Strimbu (City of Gary Department of Environmental Affairs)

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Tier 2 Landfill Gas Sampling and Analysis Report Gary Sanitary Landfill City of Gary, Indiana

Prepared for:
City of Gary
Department of Environmental Affairs
504 Broadway, Suite 10112
Gary, IN 46402

Prepared by: Earth Tech, Inc. 3121 Butterfield Road Oak Brook, IL 60521

May 2002



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1.0 EXECUTIVE SUMMARY

Gary Sanitary Landfill is a closed facility located in Gary, Indiana, and is owned by the City of Gary. The landfill began accepting waste during the mid 1950's (listed as 1955 for the purposes of calculating emissions in the facilities Title V application), and has a final total design capacity of 3.379 million megagrams. Since this capacity is over 2.5 million megagrams, the facility is required to determine, under the New Source Performance Standards (NSPS) for new Municipal Solid Waste (MSW) Landfills promulgated on March 12, 1996, the emissions of non-methane organic compounds (NMOC).

A Tier II test was conducted at the facility in May 2002 to determine a site-specific NMOC concentration pursuant to an agreement between IDEM and the City of Gary.

Based on the sampling results provided in this report, NSPS gas collection and control requirements are not currently applicable and did not apply to the facility at closure (period of maximum gas generation), because non-methane organic compounds (NMOC) emissions have not exceeded 50 megagrams per year (Mg/yr). The measured site-specific NMOC concentration was determined to be 11.6 ppm NMOC as hexane. This value was used in the NSPS equation to calculate NMOC emissions of 1 Mg in 1997 (waste cessation year for the landfill – maximum emissions date), and 1 Mg in 2002. In each case, the facility did not exceed 50 Mg/yr. Each case evaluation demonstrates that the facility had emissions 2% of those mandating the installation of a gas collection system.

2.0 BACKGROUND

2.1 FACILITY DESCRIPTION

Gary Sanitary Landfill is a closed facility located in Gary, Indiana, and is owned by the City of Gary. The landfill began accepting waste in the mid 1950's. The landfill is closed with approximately 75 acres of waste in place that is at least two years old (if closed) and, as such, is suitable for Tier 2 sampling. Gary Landfill primarily operated as municipal solid waste landfill, although no records are available for inspection. Since no data is available for waste receipts, the NMOC calculations are based on 40 CFR 60.754(a)(1)(ii).

2.2 PROJECT OBJECTIVES AND APPROACH

The purpose of this work is to determine a site-specific NMOC concentration for use at the Gary Sanitary Landfill. The Tier 2 landfill gas sampling and analysis was conducted in accordance with 40 CFR 60.754. This sampling follows EPA Reference Method 25C, for NMOC concentration, and Method 3C, for nitrogen concentration. The determined concentration was used with the equation specified in $\S60.754(a)(1)(ii)$ to evaluate the landfill mass emission rate of NMOC in Mg/yr.

3.0 SAMPLING METHODOLOGY

3.1 GAS SAMPLING

The Gary Sanitary Landfill currently has 25 passive solar flares and a single candlestick flare connected to 8 perimeter landfill gas extraction wells. A combination of sampling from the solar flares, the individual wells connected to the single flare, and from sampling probes was conducted. If field checks (with a Landtec field gas analyzer) showed greater than 40 percent methane was present (with little or no oxygen), the vents or wells were used for sampling. Each vent or well replaced the need for one probe, but an even distribution of vents, wells and probes was maintained over the landfill. The passive flares were shut off and capped and allowed to equilibrate for approximately 24 hours prior to sampling.

Where the flares were not utilized, pre-cleaned 5.25 foot long by 0.38-inch outside-diameter steel sampling rods were inserted through the landfill cover. Each sample rod was inserted at least 3 feet (0.9 meters) into the underlying landfill waste material. Each sample rod was sealed at the ground surface with bentonite to ensure a good seal between the landfill cover and the sample rods. After the sample rods were sealed in place, Teflon covers were placed on top of the rods to prevent ambient air from entering the rods or gases from seeping out of the landfill gas sampling location.

Sampling was delayed approximately 24 hours from the time the sample probes were inserted into the landfill to ensure the bentonite was hydrated and to allow the landfill gas to reach equilibrium within the sample rod. After 24 hours, the methane, carbon dioxide, and oxygen levels in the sample rods were measured with a field gas analyzer, to assure the samples would be valid. An evacuated sample canister was then attached to each sample rod. Atmospheric Analysis and Consulting, Inc. provided the precleaned four-liter stainless steel gas canisters. The landfill gas sample was collected at a flow rate of less than 500 ml/min. If the gauge pressure at the sample probe was not more than 0.05 inch H₂O or the methane and carbon dioxide concentrations did not total greater than 80%, the sample probe was not used and a new sampling site was selected.

All samples were logged in the field, and chain-of-custody forms were used for each of the samples. The field data appears in Appendix A.

3.2 SAMPLING LOCATIONS

The NSPS requires collection of two samples per hectare of landfill surface area in which waste has been in-place for a minimum of two years. At the Gary Sanitary Landfill, approximately 75 acres, or 30.35 hectares, were filled between 1955 and 1998. Pursuant to 40 CFR 60.754(a)(3), landfills larger than 25 hectares need only collect 50 samples. As such, 50 samples were collected from the site. Sampling locations are shown on the map on Figure 1.

4.0 LABORATORY ANALYSIS

Atmospheric Analysis and Consulting, Inc., Ventura, California, performed the laboratory analysis for the samples. Samples were analyzed using EPA Reference Methods 25C and 3C. Reference Method 25C provides results for NMOC, carbon dioxide, and methane. Nitrogen and oxygen content were analyzed in the laboratory using EPA Reference Method 3C.

The methane, carbon dioxide, oxygen, nitrogen, and NMOC content for each sample are shown in Table 2. NMOC concentrations for all samples were averaged to determine the site-specific NMOC concentration. The laboratory documentation from the analysis of the samples from Methods 25C and 3C are included in Appendix B of this report. All samples where nitrogen exceeded the allowable limit were not included in the average.

TABLE 1
GARY LANDFILL METHODS 25C AND 3C GAS DATA

Client ID	%Methane	%CO2	%Oxygen	%Nitrogen	NMOC as Methane (ppm)	NMOC as Hexane (ppm)
26	56.5	37.7	2.41	3.35	25.80	4.30
30	1.0	0.4	17.66	80.94	10.91	1.82
31	60.2	36.9	2.86	ND	22.74	3.79
36	59.8	35.2	2.22	2.77	32.92	5.49
44	21.4	10.8	11.27	56.54	ND	0.00
53	32.8	17.1	8.16	41.88	20.63	3.44
54	60.3	34.2	0.90	4.61	125.52	20.92
60	58.5	36.1	1.35	4.05	96.11	16.02
62	68.1	25.0	1.14	5.81	50.29	8.38
63	56.7	34.0	0.86	8.44	73.32	12.22
72	57.4	36.8	1.08	4.65	26.92	4.49
78	60.4	37.7	0.82	1.05	36.02	6.00
80	57.4	37.1	1.02	4.45	92.59	15.43
81	61.1	37.2	0.90	0.74	101.50	16.92
83	57.7	38.2	2.25	1.90	19.73	3.29
84	0.2	ND	15.85	83.80	4.78	0.80
89	62.0	35.7	2.28	ND	206.22	34.37
92	65.1	33.5	1.44	ND	43.60	7.27
96	56.0	35.7	1.68	6.65	40.07	6.68
99	59.1	35.8	2.94	2.17	82.03	13.67
102	36.0	19.8	6.76	37.39	24.64	4.11
103	60.6	37.3	2.13	ND	13.80	2.30
104	59.5	36.2	1.63	2.60	89.56	14.93
105	60.5	37.5	1.93	ND	40.81	6.80
128	45.0	30.0	1.55	23.40	20.68	3.45
131	53.8	34.8	2.54	8.90	27.08	4.51
138	52.4	32.4	2.29	12.84	35.04	5.84
140	61.8	36.6	1.56	ND	116.07	19.34
141	ND	0.2	16.49	83.30	7.43	1.24

Client ID	%Methane	%CO2	%Oxygen	%Nitrogen	NMOC as Methane (ppm)	NMOC as Hexane (ppm)
147	62.0	37.0	1.02	ND	84.10	14.02
149	57.1	35.7	1.55	5.63	116.07	19.34
162	64.9	28.6	1.12	5.31	41.55	6.93
163	59.7	37.0	1.63	1.63	79.45	13.24
164	63.3	33.7	1.41	1.58	21.93	3.65
165	59.9	34.8	2.53	2.73	125.59	20.93
166	61.1	35.0	1.56	2.37	151.96	25.33
167	37.7	7.9	9.50	44.91	24.30	4.05
169	60.7	36.4	1.51	1.42	97.46	16.24
173	64.9	33.0	1.96	0.18	48.26	8.04
174	60.6	36.9	2.48	ND	113.59	18.93
181	61.0	37.8	1.01	0.12	77.75	12.96
184	60.4	36.2	1.38	1.99	155.48	25.91
185	58.1	31.2	2.80	7.95	36.22	6.04
192	53.8	34.7	2.25	9.16	27.68	4.61
193	65.4	31.7	1.33	1.56	33.02	5.50
195	57.2	37.3	0.91	4.54	27.57	4.60
197	0.9	2.3	15.65	81.17	4.32	0.72
206	22.8	13.1	11.20	52.98	8.29	1.38
209	62.1	36.1	1.12	0.75	71.99	12.00
1000	0.5	0.5	16.53	82.50	9.58	1.60
Average	59.9	35.3	1.7	3.1	69.4	11.6

Note: The Averages are for all samples that show a Nitrogen concentration of below 20%.

Results of the landfill gas analysis are consistent with values expected for landfill gas (high methane and carbon dioxide, and low oxygen and nitrogen). The results of methane, carbon dioxide, and oxygen are also fairly consistent with the field-measured data. Method 25C requires the nitrogen and oxygen content to be less than 20% and 5%, respectively. All results for nitrogen were below 10% (100,000 ppm), and all results for oxygen were below 5% (50,000 ppm). In general, the data suggests that sample procedures were conducted correctly and the samples consisted of landfill gas.

5.0 DATA CALCULATIONS AND EVALUATION

The site-specific average NMOC concentration was used in the equation specified in §60.754(a)(1)(ii) to calculate the 1997 and 2002 estimated Tier 2 NMOC emissions for Gary Landfill. The equation specified at §60.754(a)(3)(i) and the parameters used to estimate NMOC emissions are shown below:

§60.754(a)(1)(ii) Equation (For landfills where the annual acceptance rate is unknown)

$$M_{NMOC} = 2L_0 R (e^{-kc} - e^{-kt}) (C_{NMOC})(3.6 \times 10^{-9})$$

where,

```
Total mass emission rate of NMOC from the landfill, Mg/yr
M_{NMOC}
               Refuse methane generation potential*
                                                                 170 \, (m^3/Mg)
L_{o}
R
               Average annual acceptance rate
                                                                 varies (Mg)**
k
               Methane generation rate constant*
                                                                 0.05 (1/yr)
               Age of the ith landfill cell
                                                                 varies (yrs)
t
               time since closure, years. For active landfill c = 0 and e^{-kc} = 1
С
               Concentration of NMOC
                                                                 11.6 (ppm as hexane)
C_{NMOC}
3.6 \times 10^{-9} =
               Conversion factor
```

- * Default values (taken from 40 CFR Section 60.754 (a)(1))
- ** An attachment of the full ith section summation for t_i and M_i, is provided in Appendix C.

The waste data for the purposes of this evaluation was determined based on the Design Capacity Report submitted to the agency on 6/10/1996.

Maximum NMOC emissions rate:

 $M_{NMOC} = 1 Mg/yr$

Based on the results, the NSPS Subpart WWW gas collection and control requirements do not apply to the facility because the NMOC emission rate is less than 50 Mg/yr. Spreadsheet calculations are attached in Appendix C.

FIGURE 1 GARY SANITARY LANDFILL SAMPLE LOCATION MAP

APPENDIX A

FIELD DATA

Gary Landfill Tier II Field Results

		tion			a Sample	12 E 19 19 19 19 19 19 19 19 19 19 19 19 19	36 B	Gas Qual	ity	and the second	2000年1月1日
Sample	Northing	Easting	Install Date	Date	Time	CH4	CO2	⊘ ⊘02	Balance	Pressure	Sample II
P-1	5485.71	4729.9	5/1/02	5/3/02	10:50	0.0	0.0	21.1	70.9	0.0	141
P-2	5491.54	4576.52	5/1/02	5/2/02	18:35	0,8	0.7	20.6	78.7	0.3	30
P-3	5618.63	4306.96	5/1/02	5/2/02	18:20	1.5	1.2	19.9	77.8	0.5	1000
P-4	5237.98	4090.95	5/1/02	5/2/02	9:20	0.2	0.1	21.1	78.9	0.1	84
P-5	5335.55	3649.61	5/1/02	5/2/02	9:25	63.5	36.1	0.7	0.0	0.2	53
P-6	5332.84	3078.44	5/1/02	5/2/02	18:45	60.1	39.0	0.8	0.0	4.7	166
P-7	5373,19	2690.95	5/1/02	5/2/02	10:10	52.0	13.3	6.3	30,8	0.1	167
P-8	5607.79	2624,61	5/1/02	5/2/02	10:25	62.6	37.0	0.0	0.0	4.6	164
P-9	5775.61	2614.99	5/1/02	5/2/02	10:40	59.1	40.8	0.0	0.3	7.2	103
P-10	6214.9	2583.69	5/1/02	5/2/02	10:55	57.0	42.6	0.0	0.8	2.6	83
P-11	6398	2619.8	5/1/02	5/2/02	4:00	1.6	0.1	20.0	77.8	0.1	197
P-12	6584.41	2655.6	5/1/02	5/2/02	14:30	42.5	27.0	4.9	33.1	0.5	102
P-13	6409.74	2961.26	5/1/02	5/2/02	14:40	57,1	41.9	0.3	0.9	0.6	142
P-14	6465.7	3266.18	5/1/02	5/2/02	14:45	51.5	31.8	3.2	13.5	0.6	185
P-15	6669.94	3548.52	5/1/02	5/2/02	15:10	59.3	40.1	0.0	1.0	6.1	206
P-16	6449.32	3928.28	5/1/02	5/2/02	16:30	44.0	33.6	0.0	22.1	0.5	128
P-17	6169.82	3786.4	5/1/02	5/2/02	17:30	58.2	40.2	1.1	0.9	0.5	209
P-18	5908.63	4049.13	5/1/02	5/2/02	17:50	59,6	39.2	0.0	2.0	0.6	165
SF-1	5787.42	2977.2		5/2/02	7:30	57.5	40.8	0.6	1.5	7.4	149
SF-2	5689.04	3212.65		5/2/02	7:50	60.0	40.0	0.0	0.0	7.2	63
SF-3	5866,37	3285.96		5/2/02	7:55	61.6	38.0	0.0	0.3	5.6	89
SF-4	5717.16	3509.29	4	5/2/02	8:15	58.5	39.6	0,0	0.0	7.4	174
SF-5	5907.13	3595.86		5/2/02	8:20	58.1	40.6	0.0	0.0	6.8	104
SF-6	5705.02	3813.44		5/2/02	8:30	59.6	40.2	0.0	0.0	8.1	181
SF-7	5565.32	3665.17	1-300-	5/2/02	8:40	63.6	37.1	0.0	0.0	9.1	184
SF-8	5501.1	3315.15		5/2/02	9:50	62.1	38.1	0.0	0.0	9.0	54
SF-9	5524.77	3013.2		5/2/02	9:40	62.7	37.6	0.0	0.0	7.2	169
SF-10	5674.98	2852.99		5/2/02	13:50	59.1	40.9	0.0	0.0	7.8	163
SF-11	5503.01	2469.77		5/2/02	10:20	63.7	35.8	0.0	0.0	0.9	173
SF-12	5712.28	2472.48		5/2/02	10:35	58.9	39.4	0.0	1.4	2.6	36
SF-13	5912.06	2465.92		5/2/02	10:50	65.8	32.7	0.0	1.7	0.7	162
SF-14	6120.16	2467.89		5/2/02	11:10	58.9	40.6	0.5	0.0	0.9	138
SF-15	6318.7	2467.02	1	5/2/02	11:25	62.1	34.4	0.6	2.5	1.0	193
SF-16	6520.93	2469.98		5/2/02	11:30	68.1	28.0	0.2	3.9	0.9	62
SF-17	5945.85	2850.94		5/2/02	11:15	57.0	42.7	0.0	0.1	6.7	195
SF-18	6722.89	2468.93		5/2/02	14:10	63.8	36.1	0.0	0,0	0.8	92
SF-19	6915,59	2475.97		5/2/02	14:55	62.2	36.5	0.0	1.4	0.8	44
SF-20	6369.38	3449.55		5/2/02	15:10	56.7	42.6	0.0	0.6	11.2	131
SF-21	6192.89	3222.34		5/2/02	15:30	57.2	42.1	0.0	1.2	10.5	78
SF-22	6229.14	2888.7		5/2/02	15:20	56.0	42.9	0.0	0.9	7.1	26
SF-23	6016.43	3086.38		5/2/02	15:40	58.9	40.7	0.0	0.5	6,1	81
SF-24	6075.23	3394.75		5/2/02	15:45	58.3	41.3	0.0	0.0	6.9	60
SF-25	6517.37	3709.16	23/09/200	5/2/02	15:55	56.9	42.3	0.0	1.4	8.9	72
SF-26	6218.59	3586.22		5/2/02	17:25	57,2	42.8	0.0	0.0	8.2	105
SF-27	6237.1	3914.7		5/2/02	16:40	57.3	42.2	0.0	0.5	9.4	96
SF-28	5997.73	3994.67		5/2/02	17:35	58.9	40.4	0.0	0.7	8.4	99
SF-29	5569.07	3971.13		5/2/02	17:40	57.7	42.4	0.0	0.2	8.3	80
SF-30	5707.13	3962.44		5/2/02	18:00	59.5	40.2	0.0	0.2	7.6	140
SF-31	5780,49	4177,85	2000 	5/2/02	18:05	59.0	40.1	0.0	0.1	7.6	147
SF-32	5458.1	4184.14		5/2/02	18:10	57.7	40.1	0.0	1.6	7.5	31
						522		All Still Server			117.5
ERAGE	1										

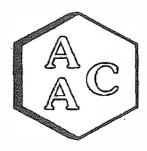
Atmospheric Analysis & Consulting (AAC)
Gas Quality Meter - Earth Tech Gem 2000 - Calibrated 5/2/02 @ 6:00 am

5/2/02 barometric pressure 29.7 - overcast - 50 deg. F

5/3/02 barometric pressure 30.1 - clear - 50 deg, F

APPENDIX B LABORATORY ANALYSIS RESULTS

25 Hora



Laboratory Analysis Report

Client:

Earth Tech

44567 / 300-02-3193

Matrix

Units

Project No.

Air

Percentage (%)

Sampling Date

Receiving Date

Analysis Date

Report Date

5/6/2002 to 5/9/2002

5/14/2002

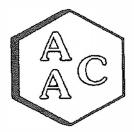
5/3/2002

5/6/2002

EPA Method 3C

Detection I	imit: 0.1 %			Analyte		
Client ID	AAC ID	Oxygen	Nitrogen	CO	Methane	CO2
163	223193-33	1.6	1.6	ND	59.7	37.0
164	223193-34	1.4	1.6	ND	63.3	33.7
165	223193-35	2.5	2.7	ND	59.9	34.8
166	223193-36	1.6	2.4	ND	61.1	35.0
167	223193-37	9.5	44.9	ND	37.7	7.9
169	223193-38	1.5	1.4	ND	60.7	36.4
173	223193-39	2.0	0.2	ND	64.9	33.0
174	223193-40	2.5	ND	ND	60.6	36.9
181	223193-41	1.0	0.1	ND	61.0	37.8
184	223193-42	1.4	2.0	ND	60.4	36.2
185	223193-43	2.8	7.9	ND	58.1	31.2
192	223193-44	2.3	9.2	ND	53.8	34.7
193	223193-45	1.3	1.6	ND	65.4	31.7
195	223193-46	0.9	4.5	ND	57.2	37.3
197	223193-47	15.7	81.2	ND	0.9	2.3
206	223193-48	11.2	53.0	ND	22.8	13.1
209	223193-49	1.1	0.7	ND	62.1	36.1
1000	223193-50	16.5	82.5	ND	0.5	0.5





Laboratory Analysis Report

Client:

Earth Tech

44567 / 300-02-3193

Matrix

Project No.

Air

Units Percentage (%) Sampling Date

5/3/2002

Receiving Date

5/6/2002

Analysis Date

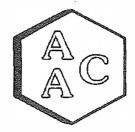
5/6/2002 to 5/9/2002

Report Date

5/14/2002

EPA Method 3C

Detection L	imit: 0.1 %			Analyte		
Client LD	AACID	Oxygen	Nitrogen	CO	Methane	CO2
26	223193-1	2.4	3.3	ND	56.5	37.7
30	223193-2	17.7	80.9	ND	1.0	0.4
31	223193-3	2.9	ND	ND	60.2	36.9
36	223193-4	2.2	2.8	ND	59.8	35.2
44	223193-5	11.3	56.5	ND	21.4	10.8
53	223193-6	8.2	41.9	ND	32.8	17.1
54	223193-7	0.9	4.6	ND	60.3	34.2
60	223193-8	1.3	4.0	ND	58.5	36.1
62	223193-9	1.1	5.8	ND	68.1	25.0
63	223193-10	0.9	8.4	ND	56.7	34.0
72	223193-11	1.1	4.7	ND	57.4	36.8
78	223193-12	0.8	1.1	ND	60.4	37.7
80	223193-13	1.0	4.5	ND	57.4	37.1
81	223193-14	0.9	0.7	ND	61.1	37.2
83	223193-15	2.2	1.9	ND	57.7	38.2
84	223193-16	15.9	83.8	ND	0.2	ND



Laboratory Analysis Report

Client:

Earth Tech

44567 / 300-02-3193

Sampling Date

5/3/2002

Project No.

11307720

Receiving Date

5/6/2002

Matrix

Air

Analysis Date

5/6/2002 to 5/9/2002

Units

Percentage (%)

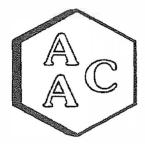
Report Date

5/14/2002

EPA Method 3C

Detection I	imit: 0.1 %			Analyte		
Client ID	AAC ID.,	Oxygen	Nitrogen	CO	Methane	CO2
89	223193-17	2.3	ND	ND	62.0	35.7
92	223193-18	1.4	ND	ND	65.1	33.5
96	223193-19	1.7	6.7	ND	56.0	35.7
99	223193-20	2.9	2.2	ND	59.1	35.8
102	223193-21	6.8	37.4	ND	36.0	19.8
103	223193-22	2.1	ND	ND	60.6	37.3
104	223193-23	1.6	2.6	ND	59.5	36.2
105	223193-24	1.9	ND	ND	60.5	37.5
128	223193-25	1.6	23.4	ND	45.0	30.0
131	223193-26	2.5	8.9	ND	53.8	34.8
138	223193-27	2.3	12.8	ND	52.4	32.4
140	223193-28	1.6	ND	ND	61.8	36.6
141	223193-29	16.5	83.3	ND	ND	0.2
147	223193-30	1.0	ND	ND	62.0	37.0
149	223193-31	1.5	5.6	ND	57.1	35.7
162	223193-32	1.1	5.3	ND	64.9	28.6

Dr. Sucha Parmar



Quality Control/Quality Assurance Report

Date Analyzed

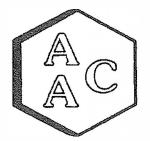
5/6/2002

I-Method Blank

	Analyte	Units	Sample Analysis	
	Oxygen	%	ND	
	Nitrogen	%	ND	
Method Blank	Carbon Nonoxide	%	ND	
	Methane	%	ND	
	Carbon Dioxide	%	ND	

II-LCS

Analyte	Units	True Conc.	LCS Conc.	LCS Dup Conc.	% RPD	% Rec
Oxygen	%	10.50	9.21	9.21	0.00	87.71
Nitrogen	%	39.00	36.46	36.46	0.00	93.49
Carbon Nonoxide	%	2.50	2.61	2.58	1.16	103.80
Methane	9/0	2.00	2.19	2.14	2.31	108.25
Carbon Dioxide	%	2.50	2.59	2.56	1.17	103.00



Date Analyzed

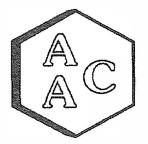
5/6/2002

III-Sample Duplicate Analysis

AAC ID	Analyte	Units	Sample Analysis	Duplicate Analysis	Mean	% RPD
223193-1	Oxygen	%	0.91	0.95	0.93	4.30
223193-1	Nitrogen	%	38.88	38.62	38.75	0.67
223193-1	Carbon Nonoxide	%	0.00	0.00	0.00	0.00
223193-1	Methane	%	22.60	20.93	21.77	7.67
223193-1	Carbon Dioxide	%	15.15	13.90	14.53	8.61

IV-Matrix Spike Analysis

AAC ID	Analyte	Units	Matrix Spike Analysis	Spike Dup Analysis	%Rec.	% RPD
223193-1	Carbon Nonoxide	%	2.55	2.67	104.40	4.60
223193-1	Methane	%	12.67	12.60	87.63	0.55
223193-1	Carbon Dioxide	%	9.55	9.57	91.90	0.21



Quality Control/Quality Assurance Report

Date Analyzed

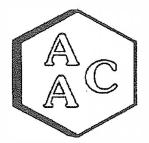
5/7/2002

I-Method Blank

	Analyte	Units	Sample Analysis
	Oxygen	2/6	ND
	Nitrogen	%	ND
Method Blank	Carbon Nonoxide	%	ND
	Methane	%	ND
	Carbon Dioxide	%	ND

Π-LCS

Analyte	Units	True Conc.	LCS Conc.	LCS Dup Conc.	% RPD	% Rec
Oxygen	%	10.50	9.40	9.40	0.00	89.52
Nitrogen	%	39.00	40.04	40.04	0.00	102.67
Carbon Nonoxide	%	2.50	2.58	2.54	1.56	102.40
Methane	%	2.00	2.16	2.15	0.46	107.75
Carbon Dioxide	%	2.50	2.56	2.53	1.18	101.80



Date Analyzed

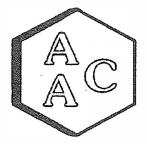
5/7/2002

III-Sample Duplicate Analysis

AAC ID	Analyte	Units	Sample Analysis	Duplicate Analysis	Mean	% RPD
223193-6	Oxygen	%	3.25	3.17	3.21	2.49
223193-6	Nitrogen	%	54.13	53.81	53.97	0.59
223193-6	Carbon Nonoxide	%	0.00	0.00	0.00	0.00
223193-6	Methane	%	13.28	12.54	12.91	5.73
223193-6	Carbon Dioxide	%	6.89	6.58	6.74	4.60

IV-Matrix Spike Analysis

AAC ID	Analyte	Units	Matrix Spike Analysis	Spike Dup Analysis	%Rec.	% RPD
223193-6	Carbon Nonoxide	%	2.70	2.60	106.00	3.77
223193-6	Methane	%	8.46	8.48	100.75	0.24
223193-6	Carbon Dioxide	%	5.87	5.94	101.50	1.19



Quality Control/Quality Assurance Report

Date Analyzed

5/8/2002

I-Method Blank

	Analyte	Units	Sample Analysis
	Oxygen	%	ND
	Nitrogen	%	ND
Method Blank	Carbon Nonoxide	%	ND
	Methane	%	ND
	Carbon Dioxide	⁵ / ₀	ND

II-LCS

Analyte	Units	True Conc.	LCS Conc.	LCS Dup Conc.	% RPD	% Rec
Oxygen	%	10.50	9.59	9.59	●.00	91.33
Nitrogen	%	39.00	40.62	40.62	0.00	104.15
Carbon Nonoxide	%	2.50	2.37	2.41	1.67	95.60
Methane	%	2.00	2.18	2.13	2.32	107.75
Carbon Dioxide	%	2.50	2.40	2.38	0.84	95.60



Date Analyzed

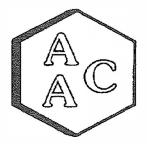
5/8/2002

III-Sample Duplicate Analysis

AAC ID	Analyte	Units	Sample Analysis	Duplicate Analysis	Mean	% RPD
223193-26	Oxygen	%	1.06	1.03	1.05	2.87
223193-26	Nitrogen	%	41.57	40.78	41.18	1.92
223193-26	Carbon Nonoxide	%	0.00	0.00	0.00	0.00
223193-26	Methane	%	22.29	22.20	22.25	0.40
223193-26	Carbon Dioxide	%	14.35	14.40	14.38	0.35

IV-Matrix Spike Analysis

AAC ID	Analyte	Units	Matrix Spike Analysis	Spike Dup Analysis	%Rec.	% RPD
223193-26	Carbon Nonoxide	%	2.60	2.53	102.60	2.73
223193-26	Methane	%	13.36	13.37	112.13	0.07
223193-26	Carbon Dioxide	%	9.47	9.51	92.10	0.42



Quality Control/Quality Assurance Report

Date Analyzed

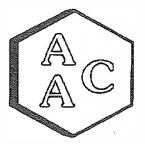
5/9/2002

I-Method Blank

	Analyte	Units	Sample Analysis
	Oxygen	%	ND
	Nitrogen	%	ND
Method Blank	Carbon Nonoxide	%	ND
	Methane	%	ND
	Carbon Dioxide	%	ND

II-LCS

Analyte	Units	True Conc.	LCS Conc.	LCS Dup Conc.	% RPD	% Rec
Oxygen	°/ ₀	10.50	9.35	9,35	0.00	89.05
Nitrogen	%	39.00	39.54	39.54	0.00	101.38
Carbon Nonoxide	%	2.50	2.50	2.48	0.80	99.60
Methane	0/9	2.00	2.17	2.11	2.80	107.00
Carbon Dioxide	%	2.50	2.53	2.51	0.79	100.80



Date Analyzed

5/9/2002

III-Sample Duplicate Analysis

AACID	Analyte	Units	Sample Analysis	Duplicate Analysis	Mean	% RPD
223193-46	Oxygen	%	0.41	0.36	0.39	12.99
223193-46	Nitrogen	%	39.23	39.67	39.45	1.12
223193-46	Carbon Nonoxide	9/6	0.00	0.00	0.00	0.00
223193-46	Methane	%	24.32	24.87	24.60	2.24
223193-46	Carbon Dioxide	%	16.04	16.04	16.04	0.00

IV-Matrix Spike Analysis

AACID	Analyte	Units	Matrix Spike Analysis	Spilke Dup o Analysis	%Rec.	% RPD
223193-46	Carbon Nonoxide	%	2.59	2.62	104.20	1.15
223193-46	Methane	%	14.18	14.30	97.13	0.84
223193-46	Carbon Dioxide	a ∕₀	10.37	10.39	94.40	0.19



Laboratory Analysis Report

Client

Earth Tech

Project No.

44567 / 300-02-3193

Matrix

Air

Units

ppmv

Sampling Date

Receiving Date 5/6/2002

Analysis Date

5/6/2002 to 5/10/2002

Report Date

5/14/2002

5/3/2002

EPA Method 25C

Detection	Detection Limit					
Client Sample ID	AACID 🛊	NMHC				
26	223193-1	25.8				
30	223193-2	10.9				
31	223193-3	22.7				
36	223193-4	32.9				
44	223193-5	ND				
53	223193-6	20.6				
54	223193-7	125.5				
60	223193-8	96.1				
62	223193-9	50.3				
63	223193-10	73.3				
72	223193-11	26.9				
78	223193-12	36.0				
80	223193-13	92.6				
81	223193-14	101.5				
83	223193-15	19.7				
84	223193-16	4.8				
89	223193-17	206.2				
92	223193-18	43.6				
96	223193-19	40.1				
99	223193-20	82.0				

NMHC = Non-Methane Hydrocarbons as Methane

Dr. Sucha Parmar



Laboratory Analysis Report

Client

Earth Tech

Project No.

44567 / 300-02-3193

Matrix Units

Air

ppmv

Sampling Date

Receiving Date

Analysis Date

Report Date

5/3/2002 5/6/2002

5/6/2002 to 5/10/2002

5/14/2002

EPA Method 25C

Detection	0.3 ppmv		
Client Sample ID	AAC JD	NMHC	
102	223193-21	24.6	
103	223193-22	13.8	
104	223193-23	89.6	
105	223193-24	40.8	
128	223193-25	20.7	
131	223193-26	27.1	
138	223193-27	35.0	
140	223193-28	116.1	
141	223193-29	7.4 84.1	
147	223193-30		
149	223193-31	116.1	
162	223193-32	41.6	
163	223193-33	79.4	
164	223193-34	21.9	
165	223193-35	125.6	
166	223193-36	152.0	
167	223193-37	24.3	
169	223193-38	97.5	
173	223193-39	48.3	
174	223193-40	113.6	

NMHC = Non-Methane Hydrocarbons as Methane



Laboratory Analysis Report

Client

Earth Tech

Project No.

44567 / 300-02-3193

Matrix

Air

Units ppmv Sampling Date

Receiving Date

Analysis Date Report Date

5/6/2002 5/6/2002 to 5/10/2002

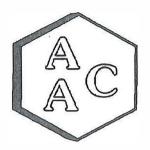
5/3/2002

5/14/2002

EPA Method 25C

Detection	Limit	0.3 ppmv
Client Sample ID	AACID	NMHC
181	223193-41	77.7
184	223193-42	155.5
185	223193-43	36.2
192	223193-44	27.7
193	223193-45	33.0
195	223193-46	27.6
197	223193-47	4.3
206	223193-48	8.3
209	223193-49	72.0
1000	223193-50	9.6

NMHC = Non-Methane Hydrocarbons as Methane



Quality Control/Quality Assurance Report

Date Analyzed

5/6/2002

I-Method Blank

	Analyte	a Units	Sample Analysis
Method Blank	NMHC	ppmv	ND

II-LCS

Analyte	Units	True Conc.	LCS Conc.	LCS Dup Conc.	% RPD	% Rec
NMHC	ppmv	86.50	78.28	81.48	4.01	104.09

III-Sample Duplicate Analysis

AAC ID	Analyte	Units	Sample Analysis	Duplicate Analysis	Mean	% RPD
223193-1	NMHC	ppmv	3.40	3.45	3.43	1.46

IV-Matrix Spike Analysis

AAC ID	Analyte	Units	Matrix Spike Analysis	Spike Dup Analysis	%Rec.	% RPD
223193-1	NMHC	ppmv	78.99	81.45	88.78	2.77



Quality Control/Quality Assurance Report

Date Analyzed

5/7/2002

I-Method Blank

and the second	Analyte	Units	Sample Analysis
Method Blank	NMHC	ppmv	ND

II-LCS

Analyte	Units	True Conc.	LCS Conc.	LCS Dup Conc.	% RPD	% Rec
NMHC	ppm	86.50	87.72	88.24	0.59	100.59

III-Sample Duplicate Analysis

AACID	Analyte	Units	Sample Analysis	Duplicate Analysis	Mean	% RPD
223193-6	NMHC	ppmv	2.76	2.67	2.72	3.31

IV-Matrix Spike Analysis

AAC ID	Analyte	Units	Matrix Spike Analysis	Spike Dup Analysis	%Rec.	% RPD
223193-6	NMHC	ppmv	84.44	82.89	93.58	1.66



Quality Control/Quality Assurance Report

Date Analyzed

5/8/2002

I-Method Blank

	Analyte	Units	Sample Analysis
Method Blank	NMHC	ppmv	ND

II-LCS

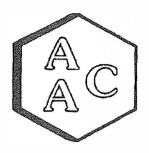
Analyte	Units	True Conc.	LCS Conc.	LCS Dup Conc.	% RPD	% Rec
NMHC	ppm	86.50	86.02	85.23	0.92	99.08

III-Sample Duplicate Analysis

AAC ID	Analyte	Units	Sample Analysis	Duplicate Analysis	Mean	% RPD
223193-26	NMHC	ppmv	3.63	3.61	3.62	0.55

IV-Matrix Spike Analysis

AAC ID	Analyte	Units	Matrix Spike Analysis	Spike Dup Analysis	%Rec.	% RPD
223193-26	NMHC	ppmv	84.85	84.56	93.74	0.31



Quality Control/Quality Assurance Report

Date Analyzed

5/10/2002

I-Method Blank

	Analyte	Units	Sample Analysis
Method Blank	NMHC	ppmv	ND

II-LCS

Analyte	Units	True Conc.	LCS Conc.	LCS Dup Conc.	% RPD	% Rec
NMHC	ppmv	86.50	86.41	87.41	1.15	101.16

III-Sample Duplicate Analysis

AAC ID	Analyte	Units	Sample Analysis	Duplicate Analysis	Mean	% RPD
223193-47	NMHC	ppmv	0.53	0.55	0.54	3.70

IV-Matrix Spike Analysis

AAC ID	Analyte	Units	Matrix Spike Analysis	Spike Dup Analysis	%Rec.	% RPD
223193-47	NMHC	ppmv	79.06	79.89	91.25	0.91

APPENDIX C NMOC EMISSIONS CALCULATIONS

APPENDIX C: **Gary Sanitary Landfill**

Determination of Maximum NMOC Emissions At Closure:

Estimated Total Decomposible Waste:

6,210,000 cu. yards (From Design Capacity Report Submitted to IDEM)

Estimated Density of Decomposible Waste:

1,200 pounds/ cu.yd.

(From Design Capacity Report Submitted to IDEM)

Estimated Mass of Decomposible Waste:

7,452,000,000 pounds

EPA Volume EMISSION CALCULATIONS

QLFG = 2LoR(e-kc-e-kt)(Cnmoc)(3.6xe-9)

0.05 1/yr

per AP-42 latest edition

Lo≕

170 m3/Mg

per AP-42 latest edition

c=

0 yr since closure

Cnmoc =

11.6 ppm as hexane

Tier II site specific sampling - 5/2002

ŧ (yr) Total in-place refuse (Mg)

R (Mg/yr) 1997.5 Evaluation Date 1997.5 Closed

42.5

3379482

79517

1955 Opened

Uncontrolled NMOC:

1 mg/year at closure

Uncontrolled NMOC:

1 tons/year at closure

Determination of NMOC Emissions (Current):

Estimated Total Decomposible Waste:

6,210,000 cu. yards (From Design Capacity Report Submitted to IDEM)

Estimated Density of Decomposible Waste:

1,200 pounds/ cu.yd.

(From Design Capacity Report Submitted to IDEM)

Estimated Mass of Decomposible Waste:

7,452,000,000 pounds

EPA Volume EMISSION CALCULATIONS

QLFG = 2LoR(e-kc-e-kt)(Cnmoc)(3.6xe-9)

0.05 1/yr

per AP-42 latest edition

Lo=

170 m3/Mg

per AP-42 latest edition

C≔

4.5 yr since closure

Cnmoc =

11.6 ppm as hexane

Tier II site specific sampling - 5/2002

(yr) 47

Total in-place refuse (Mg) 3379482

R (Mg/yr) 79517

2002 Evaluation Date 1997.5 Closed 1955 Opened

Uncontrolled NMOC:

1 mg/year (current)

Uncontrolled NMOC:

1 tons/year (current)

APPENDIX D CHAIN OF CUSTODY RECORD

Air Toxics Consulang & Chemistry

CHAIN OF CUSTODY RECORD Client/Project Name Project Location ANALYSES Field Logbook No 44567 Sampler: (Signature) Chain of Custody Tape No. Sample No./ Lab Sample Type of Identification REMARKS Date Time Number Sample 223/93-1 3200 LASERJET Relinquished by: (Signature) Daie Received by: (Signature) Date Time Time Relinquished by: (Signature) Received by: (Signature) Date Time Date Time HΡ Relinquished by: (Signature) Received for Laboratory (Signature) Date Time Date 2:17PM Sample Disposal Method: Disposed of by: (Signature) Time SAMPLE COLLECTOR ANALYTICAL LABORATORY Rob Ustson ATMOSPHERIC ANALYSIS & CONSULTING

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ATMOSPHERIC ANALYSIS & CONSULTING

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300-02-3193

40/50

CHAIN OF CUSTODY RECORD

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